

FLOWERING BEHAVIOUR IN DIFFERENT SPECIES OF *SOLANUM*

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ABSTRACT

In the present study, flowering behavior of various selected species of Solanum was traced. Comparison was made between the cultivated S. melongena varieties Haritha and Surya and the wild variants of Solanum viz., S. viarum, S. incanum, and S. gilo. The flowers of S. gilo and S. incanum opened between 5 a.m. and 6 a.m. as well as 6 a.m. and 7 a.m. respectively. Seasonal influence on the time of anthesis was prominent in the flowers of S. viarum. Here, the flowers opened between 11 a.m. and 11.30 a.m. during September – October period and between 6 a.m. and 7 a.m. during the rest of the year. In the wild variants S. viarum and S. incanum, anthers dehisced between 9 a.m. to 10 a.m. and 9 a.m. to 12 a.m. respectively depending on weather conditions. In S. gilo, the anthers dehisced nearly 30 minutes before flower opening. The change in the color of the stigmatic surface from glossy green to deep yellow at the time of initiation of stigmatic receptivity is a unique feature of S. gilo. In other wild variants of Solanum, the stigmatic surface at the time of peak stigmatic receptivity was observed to be moist plumpy and glossy green. Protandry is observed in S. gilo. While all other species were protogynous.

KEYWORDS: Anthesis, Anther Dehiscence & Stigma Receptivity

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INTRODUCTION

Brinjal is an important vegetable crop, widely consumed by the people around the globe. Appearance of visually recognizable flower bud is considered to be an indication of the onset of flowering initiation in brinjal. Flowering initiates in the cultivated brinjal nearly 40 days after transplanting (Neeraja, 2016). Maximum number of flowers opened between 7 to 8 am and began to close by 2 pm. By late evening, flowers tend to be completely closed (Prasad and Prakash, 1968). Sindhu *et al.* (1980) reported that anthesis occurred in the flowers of brinjal between 7.30 a.m. and 11 a.m. Pal and Singh (1943) stated that stigma receptivity initiated nearly 2hrs after anthesis and continued for 3 days. In certain varieties of brinjal, stigma receptivity lasted for a period of seven days. They also observed peak receptivity during 2nd day of flower opening. Kakizaki (1930) observed that soon after anthesis, pollen grains emerged through the apical pores of the anthers of *Solanum* sps. According to Prasad and Prakash (1968), duration of anther dehiscence was dependent on temperature and atmospheric humidity. They observed that anthers burst in upward direction, 15-30 minutes after flower opening.

Determination of time of anthesis, time and duration of anther dehiscence and stigma receptivity is an important aspect in carrying out distant hybridization. However, the knowledge about flowering behavior of the wild species of *Solanum* is insufficient, while it is a detrimental factor in carrying out emasculation and pollination in distant hybridization. Keeping this in view, the present study was undertaken to trace the flowering behavior of various *Solanum* sps, so that pollination operations can be carried out efficiently.

MATERIALS AND METHODS

Three wild species variants of *Solanum* viz., *S. viarum* (IC241673), *S. gilo*, (IC611554), and *S. incanum* (IC203609) maintained by NBPGR – RS, Vellanikkara as well as two high yielding varieties of brinjal (*S. melongena*), Haritha and Surya formed the material for the study. The processes as well as the time of flower opening, anther dehiscence and stigma receptivity were closely observed in all the genotypes evaluated.

Determination of Anther Dehiscence

Ten fully mature flower buds of each type were examined with hand lens since a day prior to anthesis, at regular intervals of one hour starting from 5 a.m., till the dehiscence of pollen grains to determine the time of anther dehiscence (Prasad and Krishnaprasad, 1994).

Determination of Stigmatic Receptivity

The stigmatic surface was observed at hourly interval starting from 5 a.m. on the previous day of flower opening for any change in color or appearance in the same selected buds to find out the onset of stigma receptivity. Duration of stigma receptivity was also determined following standard procedures (Radford *et al.*, 1974). Moist conditions of stigmatic surface and/ or change in color of stigmatic surface were considered as indications of onset of receptivity. Loss of receptivity was also indicated by fading of the color or drying up of stigmatic surface.

RESULTS

Change in the color of the corolla and acquisition of balloon shape by the mature flower buds was considered to be an indication that the flower is likely to be opened on the next day. Observations on the time of flower opening, changes in the color of the corolla associated with anthesis and blossom life are presented in Table 1.

Flowers were carefully observed with a hand lens to see the dehiscence of anthers through the apical pore. The time of anther dehiscence was noted (Table 2).

The stigmatic surface was observed for the presence of exudates or color change, from the previous day of flower opening starting from 6 a.m. The onset of receptivity was indicated by the change in color of the stigmatic surface. The plumpy and sticky appearance of the stigmatic surface at the time of stigma receptivity was reported by Oyelana and Oguwenmo (2012). The loss of receptivity is indicated by the fading in the color, followed by drying up of the stigmatic surface. The results are presented in Table 3.

DISCUSSIONS

The flowers of *S. gilo* and *S. incanum* opened between 5 a.m. and 6 a.m. as well as 6 a.m. and 7 a.m. respectively. Seasonal influence on the time of anthesis was prominent in the flowers of *S. viarum*. Here, the flowers opened between 11 a.m. and 11.30 a.m. during September – October period and between 6 a.m. and 7 a.m. during the rest of the year. In *S. melongena* the opening time varied from 4 a.m. and 7 a.m. depending on the genotype.

In the wild variants *S. viarum* and *S. incanum*, anthers dehisced between 9 a.m. to 10 a.m. and 9 a.m. to 12 a.m. respectively depending on weather conditions. However, according to Oyelana and Oguwenmo (2012) anthers dehisced 30 minutes prior to anthesis in *S. melongena*. In *S. gilo*, the anthers dehisced nearly 30 minutes before flower opening. Oyelana *et al.* (2016) also reported that anther dehiscence in *S. gilo* occurred 30 minutes prior to the opening of flower.

The pollen grains were dehiscent through the apical pore of anthers in all the types evaluated.

The stigmatic surface was observed for presence of exudates or color change from the previous day of flower opening starting from 6 a.m. The onset of receptivity was indicated by the change in color of the stigmatic surface. The plumpy and sticky appearance of the stigmatic surface at the time of stigma receptivity was reported by Oyelana and Oguwenmo (2012). The loss of receptivity is indicated by the fading in the color followed by drying up of the stigmatic surface.

The change in the color of the stigmatic surface from glossy green to deep yellow at the time of initiation of stigmatic receptivity is a unique feature of *S. gilo*. In other wild variants of *Solanum*, the stigmatic surface at the time of peak stigmatic receptivity was observed to be moist plumpy and glossy green. The color was found to fade with the decline in stigma receptivity. The *S. melongena* varieties Haritha and Surya also followed the same pattern.

Stigma became receptive an hour before flower opening in *S. viarum* and *S. incanum* and remained receptive for 36 hrs after flower opening. In *S. gilo* stigma receptivity initiated an hour after flower opening and was retained till 48 hours after flower opening. Oyelana and Oguwenmo (2012) also reported that in wild species of *Solanum* viz., *S. aethiopicum*, *S. gilo*, *S. anguivi*, and *S. scabrum*, stigma receptivity initiated about 45 minutes before anthesis. In *S. melongena* variety, Surya, the stigma became receptive 12 hrs before flower opening and remained receptive till 24 hours after flower opening. In *S. melongena* variety, Haritha, stigma receptivity initiated an hour before flower opening. However, the receptivity was retained only for 2 – 3 hours after flower opening. In *S. melongena* peak stigmatic receptivity was observed nearly 60 minutes prior to the opening of flowers by Oyelana and Oguwenmo (2012). However, according to Tatebe (1938), stigma receptivity initiated a day prior to flower opening and continued for 2 days even after flower opening in brinjal. According to Kakizaki (1930), stigma became receptive immediately after anthesis in the flowers of brinjal and receptivity persisted for a period of 2-3 days. Unlike in the present study, Pal and Singh (1943) also observed that stigma receptivity initiated nearly 2hrs after anthesis in brinjal.

All the species evaluated except *S. gilo* exhibited protogyny. *S. gilo*, a wild species from N. E. India was found to be protandrous.

CONCLUSIONS

Knowledge of the flowering behavior of various species is important to carry out emasculation and pollination operations. The flowers belonging to all the species open in the morning hours. *S. gilo* exhibited protogyny, while all the other species exhibited protogyny. Change in the color of the stigmatic cup from glossy green to deep yellow at the time of peak stigma receptivity is a unique feature of *S. gilo*.

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REFERENCES

1. Kakizaki, Y. 1930. Breeding crossed egg plants in Japan. *J. Hered.* 253-258.
2. Neeraja, P. 2016. Breeding biology and cross compatibility of close wild relatives of brinjal (*Solanum melongena* L.)
3. Oyelana, O. and Oguwenmo, O. K. 2012. Floral biology and the effects of plant- pollinator interaction on pollination intensity, fruit and seed set in *Solanum*. *Afric. J. Biot.* 11(84): 14967-14981.
4. Oyelana, O., Oguwenmo, O. K., and Nwangburuka, C. 2016. Cytomorphological analysis of a novel hybrid from *S. melongena* x *S. scabrum*. *Spanish. J. Ag. Res.* 7(2):355-353.
5. Pal, B. P., and Singh, H. B. 1943. Floral characters and fruit formation in the egg plant. *I. J. Genet.* 3(1): 45-58.
6. Pal, B. P., and Singh, H. B. 1943. Floral characters and fruit formation in the egg plant. *I. J. Genet.* 3(1): 45-58.
7. Prasad, D. N. and Prakash R. 1968. Floral biology of brinjal (*Solanum melongena* L.). *I. J. Agric.Sci.* 38: 1053–1061.
8. Prasad, M. K. and Krishnaprasad, M. 1994. *Outlines of microtechniques*. Emkey Publishers, New Delhi, 103p.
9. Radford, A. E., Dickson, W. C., Massery, J. R., and Ritchiebell. 1974. *Vascular plant systematics*. Harper and Raw publishers, New York, 891p.
10. Sindhu, A. S., Kalloo, and Panditha, M. L. 1980. Studies on some important aspects of floral biology in vegetable crops. *Haryana. J. Hort. Sci.* 9(3-4) 207-217.
11. Tatebe, T. 1938. On pollination of eggplant. *J. Hort.* 2: 61-69.

APPENDICES

Table 1: Anthesis in Different Species of *Solanum*

Types	Time of Flower Opening	Corolla Colour		
		Two days Before Anthesis	Previous Day of Anthesis	At Anthesis
<i>S. viarum</i>	6 to 7 a.m. 11. to 11.30 a.m. (Sept. – Oct.)	White	Light violet	Light violet
<i>S. gilo</i>	5 to 6 a.m.	White	White	White
<i>S. incanum</i>	6 to 7 a.m.	White	Pale violet	Pale violet
<i>S. indicum</i>	Did not flower			
<i>S. melongena</i>				
Haritha	4 to 7 a.m.	White	White	White
Surya	5 to 7 a.m.	White	Bluish violet	Bluish violet

Table 2: Anther Dehiscence in Different Species of *Solanum*

Types	Anther Dehiscence
<i>S. viarum</i>	2-3 hours after flower opening
<i>S. gilo</i>	30 minutes before flower opening
<i>S. incanum</i>	2-5 hours after flower opening
<i>S. indicum</i>	Not flowered
<i>S. melongena</i>	
Haritha	At flower opening
Surya	At flower opening

Table 3: Stigma Receptivity in Different Species of *Solanum*

Types	Stigma Receptivity
<i>S. viarum</i>	One hour before flower opening to 36 hours after flower opening
<i>S. gilo</i>	One hour after flower opening to 48 hours after flower opening
<i>S. incanum</i>	One hour before flower opening to 36 hours after flower opening
<i>S. indicum</i>	Not flowered
<i>S. melongena</i>	
Haritha	One hour before flower opening till 2-3 hours after flower opening
Surya	12 hours before flower flower opening till 24 hours after flower opening

